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OBESITY AND WEIGHT MANAGEMENT

'I have been all in, I have been all out and I have been everything in-between': A 2-year longitudinal qualitative study of weight loss maintenance

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Abstract

Background: Qualitative studies investigating weight management experiences are usually cross-sectional or of short duration, which limits understanding of the long-term challenges.
Methods: Eleven women [mean (SD) age 44.9 (9.8) years; body mass index 40.3 (4.0) kg m^{-2}] participated in this longitudinal qualitative study, which included up to 20 weeks of total diet replacement (825–853 kcal day^{-1}) and ongoing support for weight loss maintenance (WLM), to 2 years. Semi-structured interviews were conducted at baseline and programme end, as well as at key intervals during the intervention. Questions examined five theoretical themes: motivation, self-regulation, habits, psychological resources and social/environmental influences. Data were coded and analysed in NVIVO (https://qsrinternational.com/nvivo) using the framework method.
Results: In total, 64 interviews were completed (median, $n = 6$ per participant). Mean (SD) weight loss was 15.7 (9.6) kg (14.6% body weight) at 6 months and 9.6 (9.9) kg (8.8% body weight) at 2 years. The prespecified theoretical model offered a useful framework to capture the variability of experiences. Negative aspects of obesity were strong motivations for weight loss and maintenance. Perceiving new routines as sustainable and developing a 'maintenance mindset' was characteristic of 'Maintainers', whereas meeting emotional needs at the expense of WLM goals during periods of stress and negative mood states was reported more often by 'Regainers'. Optimistic beliefs about maintaining weight losses appeared to interfere with barrier identification and coping planning for most participants.
Conclusions: People tended to be very optimistic about WLM without acknowledging barriers and this may undermine longer-term outcomes. The potential for regain remained over time, mainly as a result of emotion-triggered eating to alleviate stress and negative feelings. More active self-regulation during these circumstances may improve WLM, and these situations represent important targets for intervention.

Introduction

Improving weight loss maintenance (WLM) remains the most significant challenge in clinical obesity management [(1)]. Evidence suggests that interventions incorporating a period of total diet replacement (TDR), where foods are replaced with nutritionally complete shakes/soups, produce larger weight losses and better WLM than standard

behavioural weight management interventions [2–4]. Programme's incorporating TDR are becoming more widely implemented, although few studies have investigated the participant experience and long-term WLM [5]. The experiences of TDR and 6 months of WLM in individuals reversing type 2 diabetes have been described [6,7], although this evidence may not reflect the experience of individuals without obesity-related comorbidities.

Longer-term, qualitative studies (at least 1 year) may capture the dynamics of weight loss, WLM and weight regain experiences in the context of structured TDR initiated weight management interventions. A systematic review synthesising 26 qualitative studies of WLM including 710 participants described maintaining behaviour change as a 'constant battle' for weight 'maintainers' and 'regainers' [8]. The review describes how adhering to new, healthier behaviour patterns generates psychological 'tension', where needs previously met by obesogenic behaviours are no longer served. However, all studies within the review were cross-sectional, except one that examined changes over time during bariatric surgery. Prospective, longitudinal research is required to provide in-depth insights into the perceptions of weight loss, WLM and weight regain [8].

Psychological theories can inform qualitative research aimed at better understanding WLM [9]. A systematic review of over 100 behavioural theories identified five maintenance themes: motives, self-regulation, habit, psychological resources, and social/environmental influences [10]. These themes require further study using applied research designs that induce change and follow maintenance over time.

The present study aimed to examine the dynamic changes in perceptions of weight loss, WLM and weight regain of individuals participating in a 2-year weight management programme.

Research questions:

1 How do individuals taking part in a 2-year weight management programme with TDR experience weight loss, WLM and weight regain over time?

2 How do WLM experiences fit with the five key themes of the behaviour change maintenance model?

3 What are the similarities and differences in experience and behaviours between 'Maintainers' and 'Regainers'?

Materials and methods

Definition of weight loss maintenance

There are no standard definitions for successful WLM, although several suggestions have been made, and defined success criteria are required if WLM is to become established as a clinical goal [11]. A weight loss of 5% [12] and 10% body weight [13] maintained for 1 year have been proposed, although these definitions conceptualise successful maintenance as net weight loss, and do not cover the aspect of maintenance of lost weight over time. Other definitions have focussed entirely on acceptable weight regain thresholds [14,15] without considering the degree of weight loss. For most people with a body mass index (BMI) >35 kg m^{-2}, obesity-related comorbidities are likely to arise or be present; therefore, interventions should be targeted towards higher weight losses for sustained improvement in health [16], and TDR-based intervention programmes carry a target weight loss of 15 kg [2]. Therefore, as part of the present study, successful 'Maintainers' were defined as having lost ≥7.5% at the 2-year study endpoint, and maintaining >50% of their initial weight loss, based on their lowest recorded study weight, thereby incorporating both overall weight loss and weight regain thresholds to reflect the importance of both elements. The criterion was developed for the present study, and applied post-hoc for data analysis. It was not used with the participants during the trial, and does not imply a lack of clinical effect if maintaining a weight loss <7.5 kg.

Participants and recruitment

This research was part of a wider, single-arm study investigating changes in body composition [17] and metabolic adaptation to weight loss [18], which was approved by the West of Scotland Research Ethics Committee (reference number: 14/WS/1164) and NHS Greater Glasgow & Clyde Research and Development Department. Participants provided their written informed consent to participate in all aspects of the study; however, ethical approval for this qualitative study was obtained after seven of 22 participants had already been recruited into the weight management programme. Of the 15 participants who consented to be interviewed, longitudinal interview data were available for 11. Weight-stable (≤5 kg weight loss in the previous 6 months) women aged 18–65 years with a BMI in the range 30–45 kg m^{-2} were recruited by posters in a local hospital. Main exclusion criteria were significant illness (e.g. heart disease/cancer), severe depression, diagnosed eating disorder or history of substance abuse. Eligibility screening was undertaken by research staff (YY/NB/GT). The study was registered prospectively with the Clinical Trials registry, identifier number: NCT02340793.

Study design

Weight management programme

Participants were asked to follow the Counterweight Plus weight management programme, which has been described in detail elsewhere [19]. Briefly, weight loss

was initiated by TDR, which provided a liquid formula diet (shakes/soups) (825–853 kcal day^{-1}) to replace all meals for a maximum of 20 weeks, followed by reintroduction of food with a progressive calorie increase (by 200 kcal every 2 weeks) until energy requirements were met, and then ongoing visits to support long-term WLM to 2 years. Weight loss and WLM review visits were scheduled for approximately 30 min and structured around goal setting, problem solving and self-monitoring. Participants also received intervention books containing information on topics such as portion control, energy balance and preventing relapse, information which was also covered during study visits. The intervention was delivered within the Clinical Research Facility at Glasgow Royal Infirmary by a registered dietitian/nutritionist (NB/YY) and participants were reviewed fortnightly during TDR and food reintroduction, as well as monthly during WLM. Changes in weight were assessed using calibrated, digital scales at each study visit.

Qualitative interviews

Data were obtained through semi-structured interviews scheduled at baseline and programme end, as well as at key intervals during weight loss and WLM phases. Interviews used a topic guide (Appendix 1) targeting the five key themes of the behaviour change maintenance model [10]: maintenance motives, psychological resources, self-regulation, habits, and social/environmental influences. Participants were told that the interviews aimed to understand their experiences of undertaking a weight management intervention and were aware that the research contributed to PhD programmes. The interviews were conversational and topics were not discussed in a rigid order, instead being addressed when they arose naturally within the discussion. Additional prompts were used to gain further insight following initial participant responses. The interviewer was a male Research Associate and Registered Dietitian with 8 years' experience of conducting patient interviews (GT; MSc Nutrition & Dietetics) who received ongoing supervision by an academic Health Psychologist (SD). The interviewer was known to participants through study visits for resting metabolic rate measurement. All interviews were conducted by telephone, audio-recorded and transcribed verbatim. No formal field notes were taken following interviews and transcripts were not returned to participants for further comment. The interview frequency was reduced if discussions on the main analytical themes became repetitive over consecutive interviews, and the decision to conduct additional interviews was informed by weight changes, which were available to the interviewer.

Data analysis

Interview transcripts were analysed in NVIVO, version 12 (https://qsrinternational.com/nvivo) by the interviewer (GT) following the principles of framework analysis[20]. A thematic approach to data analysis was taken, with transcripts coded using predetermined theory-based themes drawn from the model that informed the interview questions [10]. The analysis used a five-step process. Step 1 was data familiarisation, where interview recordings were listened to, and transcripts were read several times with significant statements being highlighted. High-level descriptors for each participant were constructed. Step 2 was coding each transcript line by line using the underlying maintenance model as a framework. Step 3 comprised detailed sub-coding and identifying emerging, higher-level sub-themes, and Step 4 was interpretation of how sub-themes unfolded both within and between participants over time, comparing interviews with those undertaken previously and subsequently to understand the change process and experience over time. Additionally, comparisons were made between 'Maintainers' and 'Regainers'. For Step 5, the sub-themes identified were conceptualised within a visual to display a practice focused model of inter-relations. Themes were checked by SD against interview transcripts for accuracy of interpretation and were discussed iteratively over several meetings. Participants were not asked to provide feedback on the findings.

Results

Participants

In total, 64 interviews were completed across this longitudinal, qualitative study (median of $n = 6$ per participant, range 4–8) and lasted 40 min on average (range 10–100 min), with 41 h of interview data available for analysis. In total, 2873 weight loss and WLM related comments were coded in transcripts under 70 sub-codes and summarised within the five overarching maintenance themes [10].

Baseline characteristics and mean (SD) weight changes of the 11 adult women [44.9 (9.8) years old; BMI = 40.4 (4.1) kg m^{-2}] who participated in the study are provided in Fig. 1 and Table 1. Based on lowest measured study weight, the mean (SD) maximum weight loss was 18.5 (10.1) kg (17.0% body weight loss) and 9.6 (9.9) kg (8.8% body weight loss) was maintained after 2 years. Two participants withdrew from the weight management programme at 5 and 18 months, respectively (one could not tolerate the diet and the other had a change in work commitments), although they remained as participants in the study and both provided final interviews and weights at 2 years, and thus they are included

in these data. Four participants (P-1, P-2, P-4 and P-11) were classified as 'Maintainers' and seven as 'Regainers'. Differences in starting BMI were marginal [Maintainers: 39.6 (4.6) kg m^{-2}; Regainers: 40.9 (4.2) kg m^{-2}]. On average, Maintainers lost 24.5 (10.5) kg [22.3% (8.1%) body weight] at 6 months and 18.5 (11.5) kg [16.8% (8.9%) body weight] at 2 years. Regainers lost 10.7 (4.4) kg [10.0% (3.6%) body weight] at 6 months and 4.3 (4.0) kg [4.4% (3.9%) body weight] at 2 years.

Data are presented under five theoretical maintenance themes: motives, self-regulation, resources, habit, and social/environmental influences. Some themes are interconnected but for clarity are presented under separate headings. Operational definitions are provided under each theme. Within each theoretical theme, sub-themes were identified. Quotes are accompanied by participant number, classification as a Maintainer or Regainer, and interview number.

Theme 1: Motives

Any motivational driver for starting and maintaining behaviour

Who to be, and who not to be

Many participants described their motives in the context of avoidance ('I don't want to be 60 and fat' P5-R-1). Increasing health concerns were a trigger for change ('I am a heart attack waiting to happen'; P6-R-1) and key life events could be a prompt for action ('I don't want to be this size when I get married'; P10-R-1). For others, urgency and commitment stemmed from a desire to escape negative self-perceptions ('I just feel totally low about my whole self, about my appearance, about everything'; P11-M-1).

For several participants, negative motives for weight loss evolved into avoidance motives for WLM ('I don't want to go back to being fat'; P2-M-7). Discarding old clothes underscored a motivation to not return to their previous identity ('I threw away the clothes that were too big for me [...] I think when I did that in a way it was closure, that's me'; P1-M-9). Major changes in weight could be accompanied by a change in self-perception for Maintainers, which appeared to be more in line with desired states ('I just feel much better about myself and how I look'; P1-M-6). For Regainers, staying motivated was more difficult when weight losses fell short of expectations ('I felt better, but I didn't feel great, I felt I needed to lose more'; P9-R-5) or lacked visibility ('Only about two people actually commented on it [15 kg weight loss] ... I didn't think I looked that much different'; P3-R-5).

The maintenance mindset

Larger weight losses appeared to be crucial for satisfaction with outcomes, and helped participants enter a 'maintenance mindset', where avoiding regain became critical ('I am happy with what I've lost and the fact that I'm able to maintain it, though I do ultimately want to lose more, but if I can continue maintaining I'll be happy with that too'; P11-M-7). When weight losses were less than expected, it perpetuated a focus on continuously trying to achieve weight loss, although avoidance of regain was also a priority ('I am nowhere near where I want to be, but I never want to be back where I was'; P7-R-4).

Inflated weight loss maintenance beliefs

Future barriers to WLM were either not expected, underestimated or coping plans were not adequate. Extensive

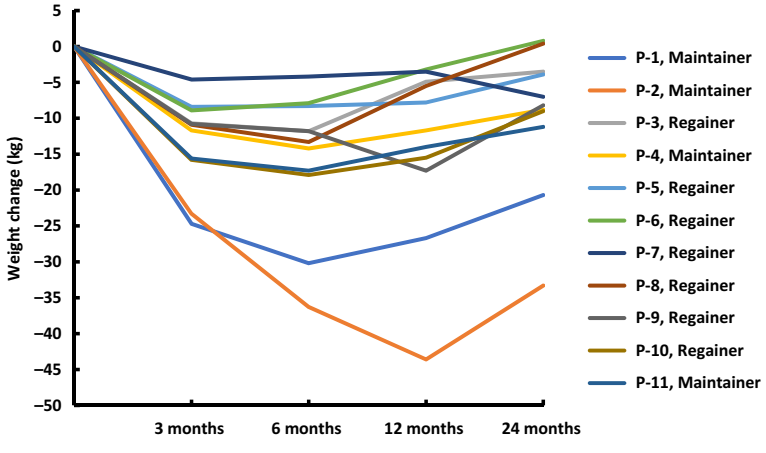

Figure 1 Weight changes of all participants from baseline to 24 months.

Table 1 Summary of participant characteristics, weight loss targets, weight loss outcomes and retention

ID	Age range	Baseline weight (kg)	BMI (kg m^{-2})	Minimum weight loss target, kg (%)*	Lowest weight (kg)	Maximum weight loss, kg (%)	2-year weight (kg)	2-year BMI (kg m^{-2})	Maintained weight loss, kg (%)	Regain, kg (%)	Drop out (Yes/No)
1	45–49	112.0	36.6	12.1 (10.8)	81.7	30.3 (27.1)	91.3	29.8	20.7 (18.5)	9.6 (31.7)	No
2	50–54	118.6	43.0	38.1 (32.1)	75.0	43.6 (36.8)	85.3	31.0	33.3 (28.1)	10.3 (23.6)	No
3	55–59	118.9	44.2	19.0 (16.0)	104.2	14.7 (12.4)	114.3	42.5	4.6 (3.9)	10.1 (68.7)	No
4	40–44	95.1	34.9	15.9 (16.7)	80.8	14.3 (15.0)	86.2	31.7	8.9 (9.4)	5.4 (37.8)	No
5	55–59	84.1	35.5	19.1 (22.7)	73.9	10.2 (12.1)	80.5	33.9	3.6 (4.3)	6.6 (64.7)	No
6	45–49	105.9	41.9	15.9 (15.0)	96.2	9.7 (9.2)	106.5	42.1	+0.6 (+0.6)	10.3 (106.2)	Yes
7	30–34	97.1	36.1	19.1 (19.7)	85.7	11.4 (11.7)	90.2	33.5	6.9 (7.1)	4.5 (39.5)	No
8	45–49	133.2	44.5	15.9 (11.9)	118.2	15.0 (11.3)	133.9	44.7	+0.7 (+0.5)	15.7 (104.7)	No
9	30–34	88.9	38.5	6.3 (7.1)	71.9	17.0 (19.1)	81.0	35.1	7.9 (8.9)	9.1 (53.5)	No
10	25–29	118	45.5	25.4 (21.5)	100.2	17.8 (15.1)	109.1	42.1	8.9 (7.5)	8.9 (50.0)	Yes
11	50–54	114.1	44.0	12.7 (11.1)	94.5	19.6 (17.2)	102.2	39.4	11.9 (10.4)	7.7 (39.3)	No
Mean	44.9	107.8	40.4	18.1 (16.8)	89.3	18.5 (17.0)	98.2	36.9	9.6 (8.8)	8.9 (56.5)	2/11
SD	9.8	15.0	4.1	8.2 (7.0)	14.6	10.1 (8.2)	16.6	5.4	9.9 (8.4)	3.0 (27.8)	–

Successful weight loss management was defined as weight loss ≥7.5% body weight at 2 years and maintaining >50% of initial weight loss, calculated from lowest achieved weight during the intervention. Participant's 1, 2, 4 and 11 were classified as successful 'Maintainers' (shaded grey) and all other participants were considered 'Regainers'.

BMI, body mass index.

*Weight loss targets were reported during baseline interviews, usually in stones/pounds, and have been converted to kilograms for ease of interpretation.

histories of losing and regaining weight were reported by most participants but did not dampen confidence that things would be different this time ('Normally, like on a diet previously, I would always put the weight back on, but I feel actually confident this time that I won't'; P4-M-3; regained 5.4 kg). Early weight losses and stopping previous habits generated confidence that relapses would not occur ('I am in a frame of mind where I am going to continue to lose weight [...] I am not inclined to just go back into old habits'; P10-R-2; regained 9 kg). There was optimism and certainty that weight losses would not be regained, which spoke of a strong determination to protect weight loss achievements but was usually misplaced ('There is no way in hell I am going back'; P9-R-3; regained 9.1 kg). Having invested time and effort into losing weight, participants had no intention of jeopardising achievements ('I don't see why I would do all that work and all that stuff just to go back again'; P2-M-7; regained 10.3 kg). New knowledge and insight into previous behaviours reinforced beliefs that regain would not happen ('I will never go back to where I was because I know how that feels, and I know how I got there'; P7-R-5; regained 4.5 kg).

Motivational conflicts

Participants described instances where managing their weight conflicted with a desire to meet emotional needs ('you have your ups and downs, it might be a crap day at work and you do get low, and yeah I probably would on a low day turn to chocolate'; P5-R-5). Regainers tended to hold onto the goal for further weight loss, but competing priorities ('I felt as if I was missing out on something,

because I'm a foodie and I like my wine, and I like drinking and I like socialising'; P6-R-4) and other responsibilities ('... it's kind of like the last thing on your agenda'; P9-R-6) could conflict with weight management and interfere with implementing intended behaviour changes. Maintaining a consistent level of motivation was challenging for all participants to an extent ('I have been all in, I have been all out and I have been everything in-between'; P7-R-6).

Theme 2: Self-regulation

Any effort to actively control behaviour

Structure, simplicity and success

The intervention began with a period of TDR, which helped participants to regain control over problematic eating behaviours ('I used to not have anything all day and then binge at night'; P9-R-3), which were replaced with a structured plan ('I have been able to follow it no bother because it is set, and I don't need to think about what I am eating, how to cook it and how to prepare it'; P4-M-2). Weight loss success was achieved quickly ('I have felt so much better in a short period of time'; P11-M-2). Loss of control was infrequently reported during TDR and reasons for lapses tended to be played down ('I was sort of picking at food, not having meals, definitely not having meals [...] but picking at things'; P3-R-3) or justified by external factors ('I had a week of illness and decided not to do the shakes ...'; P8-R-3). TDR did not suit everyone ('I would not recommend that to anybody to go on'; P6-R-4) and adherence became more difficult after 2-3 months ('I quite liked the shakes but I suppose I am just getting a bit fed up of the same taste of things'; P2-M-4).

New-normal routines

Transitioning back onto food and establishing new eating behaviours for WLM was perceived as more challenging than initial weight loss ('maintaining it is much harder than losing it, because you've kind of got to get back to normality and have a normal life, but you've still got to be conscious of what you're doing'; P11-M-7). Regainers appeared to find ongoing weight control efforts more difficult ('It's a constant battle and always will be'; P5-R-5) whereas Maintainers talked less about missing previous routines and were more accepting of the need for ongoing efforts ('I can't just do it for 6 months and then go back to the way I was [...] this has to be the way I live my life'; P11-M-6). Once these views were expressed, they remained stable and tended not to change over time.

Self-regulation inconsistency

Self-regulation of eating behaviour often appeared to be effective ('I just go 'no I don't want it', and do you know it's funny, you always feel really good and proud of yourself that you have not indulged'; P5-R-5), although the main difficulty, especially for Regainers, was consistency over time ('I can go through spells of being in control of what I am eating [...] I suppose what I have is short-term control, which maybe isn't any control at all really'; P7-R-6). Self-control could vary both within and between participants, as reflected by separate WLM interview quotes from the same participant illustrating a loss of self-regulation ('I am just going round in a circle the whole time, I am eating something and I am thinking why did you do that [...] but I can't stop myself'; P11-M-5) and re-established self-regulation ('I'm not really finding it that difficult to be honest, because I am having really whatever I want but I'm just not having as much'; P11-M-7).

Diet vigilance and flexible control

Throughout the study, participants spoke of greater vigilance of weight and diet, and an awareness of previous behaviours were often reflected upon and contrasted with changes made ('it's like night and day now compared to what it used to be like, where I would just eat everything and anything [...] now I am more focussed'; P9-R-5). Several strategies to optimise weight management were used, including not buying favourite high-calorie foods, monitoring calorie intake, self-weighing, reducing portion size and being more active. Regainers were less consistent in using behavioural strategies ('I am too scared to weigh myself just now because I don't want to get on those scales and be upset by how much I have undone what I had achieved'; P7-R-6). Over time, Maintainers developed more flexible eating patterns where favourite foods were not necessarily avoided, but enjoyed in smaller amounts or less often ('I am consciously thinking, do you know what, see if I really want a cake I will have a bit of cake, but I will have one bit of cake instead of having two or three kind of thing'; P11-M-5).

Theme 3: Psychological resources

Psychological factors that limit or deplete cognitive resources during the process of behavioural regulation

Life stress and negative mood states

Participants tended to describe diet lapses and weight regain in the context of life stress and negative mood

states. A desire to alleviate feelings of discomfort through food could conflict with weight management, especially when stress was above normal ('If it's only maybe one kind of stress, kind of work-related or home related I am fine [. . .] but if it's more than one area of my life I find it difficult'; P1-M-9). Regainers reported eating as a way to manage stress regularly, often related to work or family issues ('When I'm stressed and tired I lose the focus. I don't want to be restricting myself [. . .] I want to enjoy something nice and think oh well I have had a shit day, I deserve something good'; P7-R-6). This was a recurring difficulty during WLM, particularly for Regainers. Regular physical activity may have provided an outlet for preventing or managing day-to-day stress in Maintainers ('I take my dog out for a walk everyday now [. . .] it's quite a good release'; P11-M-7). Being unwell could interfere with routines and eating ('when I had the cold I had no energy to prepare decent food. I just thought, something quick, snacks, sweets that's what I was doing'; P5-R-4).

Weight management efforts could became destabilised when emotion regulation was not addressed ('I haven't been able to manage a separation between emotions and eating . . .'; P8-R-4) and comfort eating was often described in response to negative mood states ('I just kind of went back to my old ways of when I have been feeling really down [. . .] and I was just eating crap'; P9-R-4). Although some participants could identify barriers, overcoming them was more difficult ('I have not quite solved the emotional eating thing. I don't know how to snap out of that'; P7-R-5). Weight regain was not attributed to increased hunger, and nearly all participants reported reduced appetite after weight loss ('I don't know if your stomach shrinks or whatever, but I only need a wee bit of things now to make me satisfied'; P11-M-5).

Theme 4: Habit

New routines which contrast with previous behaviour, old habits which return

A lifestyle, not a diet

During WLM, Maintainers and some Regainers, spoke of taking a sustainable and flexible approach towards eating and weight management ('I don't look at it as a diet now, if that makes sense. I just look at it as this is how I live'; P2-M-5). Maintainers often described enjoying newly adopted eating patterns ('I have completely had a turnaround, and changed my habits, changed my lifestyle and I prefer it'; P4-M-6) and this remained stable throughout WLM even when accounting for periodic difficulties. A major difference emerged for activity patterns. All Maintainers integrated regular physical activity ('I left the car at home this morning and walked into work'; P4-M-4) or exercise ('I am really enjoying the running which I never thought I would, I couldn't have ran for a bus before'; P2-M-5) into their lifestyle. Regainers were either inactive or reported engaging infrequently.

The pull of old habits

Several participants gave examples of old habits returning, and lapses were normal ('I think for somebody who has used food as a reward, really all my life it's very, very hard to break that cycle'; P11-M-6). Few indicated that new habits had been acquired and consolidated without any ongoing self-regulation and conscious effort ('I think it will always be something that I need to work at, I think it's like any habit, you can slip back into it'; P2-M-6). There was less talk by Regainers of new routines being sustained ('I missed the freedom to go into the kitchen and eat what I wanted'; P6-R-4), although a more attentive eating approach was sustained by most participants.

Theme 5: Social and environmental influences

How behaviour is influenced by support, social situations, and environmental context

Practical, emotional and professional (P.E.P.) talks

Almost all participants felt supported by family, friends and colleagues. Several received practical help ('I said look if I'm on these shakes there's no way I'm cooking dinners, I can't do it, I can't go for shopping if I'm not eating food, it's not fair, and my husband was like "that's fine, that's no problem I'll cook"'; P11-M-7). Many participants received emotional support through encouragement ('my family, people at work, my friends . . . they are all really encouraging'; P2-M-4) and compliments ('they will say "you are looking great"'; P6-R-3). Although participants felt generally supported throughout, there was a tendency for support from family and friends to diminish over time ('obviously the same person is not going to say continuously, 'oh god you have lost lots of weight' [. . .] so that kind of stopped I guess, that inspirational factor'; P9-R-6) or for family to expect a return to normality after weight loss was achieved ('my husband and children are not very happy they are like, "are you not going to start buying biscuits and things again"'; P11-M-7). The value of support and accountability received through regular study visits and seeing a trained professional as part of the programme was viewed favourably in comparison to previous weight management experiences, and this view tended to remain stable over

the course of the programme ('I think just support, talking about it, talking through your anxieties, it just made it so much easier for me'; P5-R-5).

Navigating everyday life, and taking diet holidays

Social eating pressures were described but tended not to be major issues hindering weight management ('I have been out with friends like in town and they have been drinking and I have took the car and they have said to me, "oh just dump the car, just have a drink" and I was like, "I am actually enjoying myself, I don't need to have a drink"'; P4-M-2). Maintainers tended to integrate eating out with family/friends as part of their lifestyle ('if I want to go out and have a curry, or if want to sit and have a coffee and a cake with my friend, that's fine. But I need to then sort of account for that later on, I can't do it every day'; P11-M-6). Some Regainers reported that social eating situations could be challenging in certain contexts ('we are a kind of family of feeders and eaters'; P7-R-6) and temptations in the work environment were described by all ('people bring in sweets and biscuits and crisps and leave them all just sitting on the tables behind our desks'; P11-M-3) but, overall, these situations were not problematic for most. Several participants remained vigilant of their weight on holidays ('I found that I was actually thinking about my food choices rather than just eating anything and everything'; P4-M-3), although doing so could also conflict with relaxation and eating enjoyment, and weight gain had the potential to interrupt momentum ('I had a great time and ate and drank whatever, but then I found it hard to get back on track again'; P11-M-4).

Conceptualising the weight management journey

Based on the identified themes, we conceptualise weight management as a journey with no defined end point, and different roads can be travelled at any given time (Fig. 2). The journey begins with a 'Flying Start', driven by the TDR intervention that serves to displace previous habits and behaviours and initiate substantial weight loss. Noticeable weight loss results reinforce initial motivation and shift the mindset, providing a platform to establish new routines ('Ongoing Journey'). Further weight loss remains the focus for several individuals, whereas others seek weight stabilisation, although old habits are a threat to WLM. The weight management journey is individualised and complex and several factors influenced WLM success. The road diverges to indicate 'Maintenance Markers' and '(Re)lapse Indicators' but, in reality, differences between several individuals were small forks in the road and Maintainers could also come unstuck by '(Re)lapse Indicators'. No one factor was decisive but, on balance, life stress and negative mood states, motivational conflicts, self-regulation inconsistency and inflated WLM beliefs were '(Re)lapse Indicators' and represented individuals experiencing greater weight regains. Continued vigilance with regards to weight and diet, developing a maintenance mindset, and perceiving new routines as sustainable lifestyle changes were all factors identified as 'Maintenance Markers' and tended to occur only in the Maintainers, who achieved larger initial weight losses and better WLM. However, these dichotomies should be interpreted in context and not only as a way to distinguish 'Maintainers' and 'Regainers'. These narratives do not support the notion that 'Regainers' were always poor self-regulators, internally conflicted or overwhelmed by stress, whereas 'Maintainers' were not. These circumstances could occur periodically in all participants. Instead, it was the balance of factors within individuals, and how often difficulties were reported across time that influenced how successful WLM was and '(Re)lapse indicators' were reported more often by Regainers.

Discussion

Principal findings in relation to research questions

Weight management experiences were highly individualised; people followed differing paths and weight change trajectories, resulting in different experiences. A variety of perceptions that were examined longitudinally remained relatively stable over time. The theoretical maintenance model used to anchor the analysis is a comprehensive and general framework based on a review of over 100 theories [10] and thus was able to capture participant experiences of weight loss and WLM in detail, with all theoretical themes contributing towards understanding weight-related cognitions, behaviours and outcomes. Certain theoretical themes were more relevant to some individuals, and similarities and differences between Maintainers and Regainers were observed. High levels of motivation for weight loss and WLM were reported, views which tended to remain stable over time. All participants underestimated the likelihood of weight regain and this appeared to interfere with barrier anticipation, even when explicitly focusing on maintenance. Better long-term outcomes tended to be achieved by those with larger initial weight losses, and this was linked to greater satisfaction and changes in self-perception. Self-regulation difficulties were amplified under stress and during negative emotions, such that meeting short-term emotional needs often came at the expense of weight management.

Discussion of findings in relation to other studies

It has been proposed that behaviour change maintenance is more likely when one is satisfied with achieved

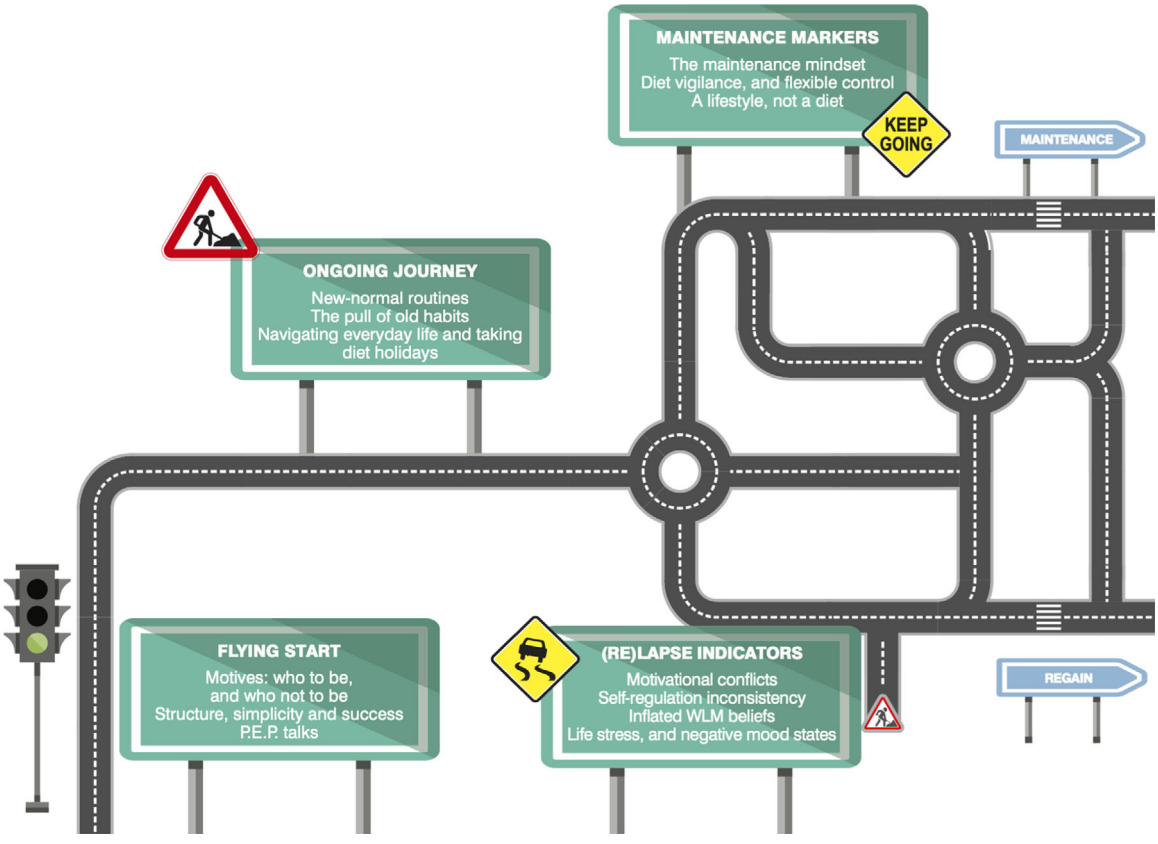

Figure 2 Sub-themes identified during the weight management journey.

outcomes [21]. In the present study, Maintainers reported greater satisfaction with weight losses and more enjoyment of new lifestyle patterns than Regainers, who failed to meet pre-intervention expectations. However, significant weight regain occurred in all participants, even when desired outcomes had been achieved and an explicit focus on WLM ('maintenance mindset') had developed, suggesting that there is more to WLM than lifestyle enjoyment and satisfaction with outcomes.

The findings reported here, as well as elsewhere [7,22], are consistent with the notion that significant weight loss and lifestyle-change can lead to a shift in identity. Maintainers reported looking and feeling better, being fitter and healthier, and having more self-confidence. The fear of losing their new identity and returning to how they felt previously underpinned behaviour change maintenance motives, something that has been conceptualised as avoidance based self-regulation [23]. For Maintainers, these views and motives remained stable over time.

In line with the 'cold-hot empathy gap' [24], favourable and possibly unrealistic expectations regarding future WLM ('inflated WLM beliefs') may have contributed to weight regains, where motivated and confident individuals (cold state) overestimate their ability to maintain healthy eating routines and weight losses during future, hot visceral states (e.g. stress, temptations). Although pessimism would unlikely to be helpful, pairing optimistic expectations with concrete plans may help individuals to achieve better WLM [25].

Highly palatable foods tend also to be high in calories, fat and sugar, leading to the perspective that eating enjoyment and weight control are largely incompatible [26]. Although weight management remained a high priority for all participants over time, the capacity for self-regulation could be compromised by certain circumstances (e.g. when stressed, low in mood), leading participants to value immediate gratification (e.g. overeating favourite foods) over delayed rewards (e.g. not regaining weight). Eating decisions based on meeting needs in the present and disregarding future consequences is known as temporal discounting [24] and offers an explanation for weight regain in the present study. Forming and practicing 'if-then implementations' may be one approach to modifying behaviour in situations that trigger impulsive responses [27] and, through the identification of key situations that influence weight-control behaviours, individuals can plan effective coping responses [28].

Regular physical activity and exercise on its own has a limited effect on weight loss [29] but may be important for successful WLM [30]. In the present study, all Maintainers reported increasing activity during and after weight loss, whereas no Regainers reported the same. Beyond energy expenditure, regular activity has positive effects on appetite regulation [31], stress management, mental health and sleep [32]. These factors may promote greater self-control of eating behaviour [33,34]. A 'flexible restraint' approach to eating was described more often by Maintainers, particularly during later WLM interviews, which could be a key factor in promoting enjoyment, sustainability and adherence [7]. Planned goal deviations (e.g. to include moderate amounts of favourite high-calorie foods within one's diet) may help to retain self-regulatory resources [35].

Almost without exception, participants perceived the weight loss phase as easier than WLM, which is in line with the literature on long-term outcomes [36–38], as well as the perceptions of other dieters [8]. Participants did not report that WLM became easier over time, although it has been reported that risk of weight regain is significantly reduced if weight losses are maintained for over 2 years [39], suggesting that behavioural changes may become more embedded over time. One of the unique aspects of a TDR intervention is that WLM requires a different approach to weight loss, and trying to *maintain* in a context of *change* may increase difficulty. The WLM process may be more straightforward when weight is lost through conventional food-based approaches [40], although achieving significant initial weight loss is less likely [36].

Weight loss is considered to alter hunger and satiety pathways in a direction favouring positive energy balance [41], although, in a separate mixed-methods analysis of the data generated as part of the present study, stress rather than hunger was perceived as the factor most likely to trigger eating/weight regain during WLM [18]. Nevertheless, self-regulation of appetite involves a complex interaction between several biological and psychological factors [42]. Psychological stress is not always a predictor of poorer WLM [30], although eating to meet emotional needs is often associated with poorer outcomes [43–46]. Even with high levels of motivation, when life stress is above normal, or when energies were diverted towards coping with negative mood states, lapses in self-regulation could occur. This is in line with the strength model of self-regulation [47], which proposes that psychological resources are depleted by the need to devote resources to cope with stress and low mood, thus impairing the ability to resist desires and exert self-control. Plentiful cognitive resources and well-thought out coping strategies to deal with difficulties appear to be important for WLM. Success may also depend in part on stable life circumstances after initial weight losses are achieved, which are not always within an individual's control.

Habits are conceptualised within the theoretical maintenance model as actions and behaviours that have become automatic over time [10]; however, over a period of at least 18 months (post TDR period), conscious regulation of dietary behaviours continued to be required, and was not described as a process requiring little effort. Complex behaviours, such as eating and physical activity, are unlikely to be performed entirely automatically. Instead, behaviours that are performed frequently and consistently but still require a degree of underlying motivation and self-regulation to implement, as in this context, require a number of behavioural acts and can be more accurately described as routines. It is difficult to accurately explore habits using qualitative methodology, given that habits, by definition, are behaviours that occur automatically. Therefore, participants were perhaps better able to reflect on trying to break habits rather than establishing new habits. Previous behavioural interventions based on habit-theory have shown some promise with respect to supporting clinically significant weight loss in adults with obesity [48], suggesting that targeting habits can form one important target for supporting long-term weight management.

Although most participants did not describe an environment that was particularly positive or negative for WLM, it is well recognised that the modern 'obesogenic' environment is a key driver of obesity [49,50] challenging our ability to self-regulate eating [42]. Some participants described ways in which they adjusted their environment to reduce access to tempting foods, and changing 'choice architecture' may have positive effects on weight-related behaviours [51]. During TDR, social situations could be troublesome but were often successfully managed. Holidays provided greater challenges, and have been associated with weight gain in prospective studies [52]. Support is not always critical [53], although the sum of the evidence suggests that poorer outcomes tend to associate with a lack of support [44] and, in the present study, family, friends and colleagues were generally supportive, particularly during weight loss. Clinical support was valued in comparison to previous weight management experiences and ongoing professional input is associated with less regain compared with self-directed approaches [54].

Strengths and weaknesses of the study

Strengths

This is one of the first longitudinal, theory-guided qualitative studies to investigate the weight management experience over a 2-year period. Conducting interviews over an extended time frame enabled unique and detailed insights

Table 2 Examples of theory-based questions which could be used by practitioners to initiate discussion around a patient's difficulties in losing or maintaining weight loss

Theoretical theme	Example questions
Motivation	• What are your main reasons for wanting to lose weight (or prevent weight regain)? • When you think about your future and what is most important to you, how does your weight management fit in to that?
Self-regulation	• When does your eating tend to go off track? • What obstacles get in the way of you keeping to your eating plan? How might you manage those?
Psychological resources	• Are there times when you feel too stressed to stick to your eating plan? • Do you eat more when you feel low in mood?
Habits	• Are there specific situations or times when you slip back into old habits? • Do you eat through boredom or for other non-hunger related reasons?
Environment and social influences	• Are you more likely to eat 'off-track' when you're with certain people (e.g. friends, family, colleagues)? • Are there certain situations when you find it difficult to keep to your eating plan (e.g. social occasions or at work)?

into the process of weight loss, WLM and regain. Studies of this nature are typically of shorter duration (e.g. 1 year or less), preventing a full understanding of long-term WLM challenges. The regular contact between researcher and participant facilitated greater trust and familiarity, which are important when discussing sensitive issues [55]. The present study is directed toward providing in-depth explanations and meanings, rather than findings that can be extrapolated as generalisable. In the'real world', intentional weight loss can be achieved by a variety of methods, over different time scales, and success at WLM depends on the degree to which the individual can adopt different eating and physical activity behaviours to those that pertained prior to intentional weight loss. Although the intervention was standardised in terms of advice, the degree to which individual participants adhered to the programme and their durations of adherence varied considerably. There was therefore a wide range of individual experiences from which to explore the range of qualitative explanations regarding weight loss and WLM.

Weaknesses

The study sample was relatively small, all participants were female and all but one was of white British ethnicity, which limits transferability to other groups. Despite the sample size, the number of interviews enabled detailed analysis. The volume of data provided analytical challenges and, although it would have been beneficial for two researchers to code the data independently to reduce the potential for bias, the majority of data analysis was performed by a single researcher. However, this was conducted alongside regular discussions with an experienced academic health psychologist, with in-depth knowledge of interview themes. The theoretical maintenance model [10] formed the basis for both the data collection and data analysis in the study and, although this increases the fit between the framework and the data, it perhaps limits the possibility for new themes to emerge. Nevertheless, all interviews contained open questions and prompts that were general in nature, thus allowing for additional information to be disclosed without the constraints of the framework. In addition, all data were examined for disconfirming evidence that did not fit the model, although no new themes were identified. WLM is inherently a continuous phenomenon and so the decision to treat it dichotomously ('Maintainers' and 'Regainers') could be considered as a limitation. Weight regain is typical and no standard definition of WLM success exists, despite several suggestions [12–15]. We defined successful WLM as losing ≥7.5% body weight and maintaining >50% of the initial weight loss at 2-year follow-up. This addresses weight loss and WLM phases, which has not been covered by other definitions and we consider that it strikes the balance between clinical benefit and WLM success. A maintained weight loss of ≥5% body weight also carries health benefit and, in applying this criterion, we may have reached different conclusions. However, we consider that this definition would be more appropriate for people with moderate rather than severe obesity (i.e. BMI 40 kg m^{-2}), which requires greater losses for sustained health improvement [16], as well as for interventions not incorporating TDR interventions, which have a target weight loss of 15 kg [2].

Possible implications for practice

Understanding the experiences of people who are trying to maintain weight losses may be beneficial for healthcare professionals working in the treatment of obesity. Exploring explanations for a patient's difficulties with respect to losing or maintaining weight loss could be achieved using theory informed, practice-based questions such as those displayed in Table 2. By helping individuals to identify

and address their particular psychological barriers for WLM in advance, the difficulties that may arise can be prepared for and dealt with more effectively. Interventions focussing on developing self-regulation skills in the face of life stress and negative mood states may improve adherence to a reduced energy diet to support WLM. Greater emphasis linking behaviours with core values may help to resolve motivational conflicts and, in addition, framing messages around behavioural change as long-term endeavours (i.e. 'a lifestyle, not a diet') may also be beneficial.

Future research directions

The literature investigating weight regain is dominated by physiological explanations [56], although psychological factors are also important. There is a need for greater integration of both perspectives within study designs. A prospective study aiming to investigate whether self-regulation training to cope with stress and negative emotions improves WLM outcomes would be of interest. Further longitudinal, qualitative research using similar (as well as different) dietary interventions aiming to investigate the experiences of men and people of different ethnic groups would be beneficial. Investigating the weight management experience of people within a group setting could provide additional insights. Future studies could consider reducing interview frequency (e.g. at baseline, end of weight loss, end of food reintroduction and end of WLM is likely to strike an appropriate balance between feasibility and data-rich narratives) and conclusions regarding qualitative findings could be strengthened by including a quantitative component within the methodology.

Conclusions

There was no single defining feature or experience common to all participants. People tend to be very optimistic about WLM without acknowledging barriers, which may compromise outcomes. Achieving and maintaining weight losses was a high priority, although self-regulatory capacity is not fixed and the potential for weight regain remained present over time, mainly as a result of emotional factors such as eating to alleviate stress and negative feelings. More active self-regulation is required during these circumstances and, thus, these situations represent important targets for intervention and may help to improve WLM.

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Conflict of interests, source of funding and authorship

The authors declare that they have no conflicts of interest.
No funding declared.
This study sits within a wider study for which all authors contributed to the design. GT and SD conceived and designed this qualitative study. GT completed the qualitative interviews. GT, NB and YY contributed to data acquisition. GT and SD completed the data analysis and interpretation. GT drafted the manuscript with input from SD. All authors critically reviewed the manuscript and approved the final version submitted for publication.

Transparency declaration

The lead author affirms that this manuscript is an honest, accurate and transparent account of the study being reported. The COREQ (Consolidated criteria for reporting qualitative research) reporting guidelines were used to ensure that we transparently detailed the methods used to achieve these findings [57]. The lead author affirms that no important aspects of the study have been omitted and that any discrepancies from the study as planned have been explained.

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[Correction added on 02 November 2020, after first online publication: The sequence of the reference list has been reordered to correspond with in-text citation]

Appendix 1
Interview topic guides informing semi-structured interviews

Baseline interviews

What has been your past experience in trying to lose weight?

Have you ever managed to lose weight on purpose?

- If yes, how many times roughly?
- How much do you typically lose?
- What is it that you typically do when you are trying to lose weight?

Have you ever managed to keep the weight that you lost off?

- If yes, for how long have you managed to keep it off?
- What is it that you typically do when you are trying to maintain weight loss?

Can you tell me about the reasons why you volunteered for this research?

What do you hope to get out of participating?

Have you talked to friends and family about participating?

- What do they think?

How much weight do you expect to lose?

How confident are you that you will be able to achieve this weight loss?

What would be your ideal amount of weight loss?

What would be an acceptable level of weight loss?

What do you think will be the challenges of participating in this study?

How do you think you will overcome these?

What do you think will be your biggest challenge of participating in this research?

Follow-up interviews – Weight loss phase

How have you been getting on over the past *X* weeks?

How much weight have you lost?

How satisfied are you with your progress over the last *X* weeks?

How satisfied are you with your weight loss?

How much do you enjoy your diet?

What do you think is the main reason for your progress in the past *X* weeks?

What have been the main challenges in the past *X* weeks?

Have you had anyone helping you or making things difficult?

Have you found yourself in tempting situations?

How hungry/stressed/tired have you been?

What did you do to overcome these?

So far, has anything changed in your life as a result of your weight loss?

How confident are you that you can achieve your weight loss goals in the next *X* weeks? How motivated are you to achieve your weight loss goals in the next *X* weeks?

What do you think will be the main challenges in the next *X* weeks?

How do you think you will overcome these?

Have you thought about what you will do protect your weight loss achievements in the future?

Baseline interview – Weight Loss Maintenance phase

How have you been getting on in the weight loss phase of the study?

How satisfied are you with your weight loss overall?

What do you think about trying to maintain weight loss from now on?

Are you happy trying to maintain weight loss rather than losing more?

Would you consider no change in weight as being a success?

How confident are you that you will be able to maintain your weight loss?

How much do you want to maintain your weight loss?

What do you think will be the challenges of maintaining your weight loss?

How do you think you will overcome these?

What do you think will be your biggest challenge of maintaining your weight loss?

Follow-up interviews – Weight Loss Maintenance phase

How have you been getting on over the past *X* weeks?

Have you managed to maintain your weight loss?

How satisfied are you with your progress over the last *X* weeks?

How satisfied are you with your weight status?

How much do you enjoy your diet?

What do you think is the main reason for your progress in the past *X* weeks?

What have been the main challenges in the past *X* weeks?

Have you had anyone helping you or making things difficult?

Have you found yourself in tempting situations?

How hungry/stressed/tired have you been?

What did you do to overcome these?

So far, has anything changed in your life as a result of your weight loss? [*awareness of WL impact*]

How confident are you that you can maintain your weight loss in the next *X* weeks?

How motivated are you to maintain your weight loss in the next *X* weeks?

What do you think will be the main challenges in the next *X* weeks?

How do you think you will overcome these?

Follow-up interviews – Weight Loss Maintenance phase – final interview

When you reflect on your weight management overall, how do you feel things have gone?

How satisfied are you with your overall progress, and weight loss?

What is your current goal with regards to your weight?

How do you see yourself now, compared with before?

Has anything changed in your life as a result of your weight loss?

How easy or difficult has it been to manage your weight?

Is there anything that you miss now, compared to your previous diet?

What would be the main reasons for your success in losing and maintaining weight?

Did people help you? If so, how?

What motivates you now to keep weight off in the long term?

Do you want to lose more, or maintain?

If you were writing a self-help book about managing weight, based on your own experience, what would be the three key points you think would be important to make?

What things have you experienced that's made managing your weight difficult?

Did anyone make things difficult for you?

How about stress? Hunger? Tempting situations?

How did you manage these barriers?

Has there been any other life circumstances that you feel have got in the way of you being able to achieve what you set out to do?

What do you think will happen with your weight in future?

Anything else you'd like to share about WL/WLM journey, that we've not covered?